BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.ME-2022/Dip.ME-2023
Course Name – Materials Science & Engineering
Course Code - DMEPC303
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify that the geometry of unit cell is known as
a) parallelepiped. b) parabola.
c) hyperbola. d) triangle.

(ii) Select, the number of atoms present in simple or primitive unit cell
a) 0 b) 1
c) 3 d) 4

(iii) Identify which property of material is responsible to resist fracture due to high impact loads.
a) Easticity b) Endurance
c) Strength d) Toughness

(iv) Select the instrument used to view the crystal structure of a material.
a) naked eye. b) optical microscope.
c) metallurgical microscope. d) X-ray techniques.

(v) Recall that atomic packing factor define as
a) distance between two adjacent atoms plane. b) projected area fraction of atoms on a plane.
c) volume fraction of atoms in cell. d) none of the mentioned.

(vi) Select the correct coordination number in simple cubic crystal structure.
a) 1 b) 2
c) 3 d) 4

(vii) Identify, machining properties of steel are improved by adding
a) phosphorous, lead and sulphur. b) silicon, aluminium and titanium.
c) vanadium and aluminium. d) chromium and nickel.

(viii) Report that diffusion can occur in _____ materials.
a) solid b) liquid
c) gaseous d) all of the mentioned

(ix) Infer the location that has no occurrence of slip planes.

a) Location of high atom density
b) Location of low atom density
c) Location of closely placed atoms
d) None of the mentioned

(x) Choose the destructive testing from the following.

a) Radiographic test
b) Dye penetrant test
c) Creep test
d) All of the mentions

(xi) Define phase in the context of material Science.

a) The substance which is physically distinct
b) The substance which is homogenous chemically
c) The substance which is both physically distinct and chemically homogenous
d) The substance which is both physically distinct and chemically heterogeneous

(xii) Judge the result of normalising of steel.

a) Refine the grain structure
b) Remove strains caused by cold working
c) Remove dislocations caused in the internal structure due to hot working
d) All of this

(xiii) Identify the heat treatment process that yields maximum hardness for a steel part.

a) Carburizing
b) Nitriding
c) Cyaniding
d) Annealing

(xiv) Predict the reaction that decompose a liquid phase into two solid phases up on cooling.

a) Eutectic
b) Eutectoid
c) Peritectic
d) Peritectoid

(xv) Choose the non-ferrous metal that is known for its light weight and is used extensively in aerospace applications.

a) Lead
b) Copper
c) Zinc
d) Titanium

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Write the purpose of heat treatment. (3)
3. Distinguish between isotropic and anisotropic materials. (3)
4. Illustrate Hume-Rothery Rules. (3)
5. Write a short note on Babbit metal. (3)
6. Differentiate between destructive and non destructive test. (3)

OR

Explain the term Malleability. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain the Sintering process. (5)
8. Illustrate Gibb's phase rule. (5)
9. State Pilling–Bedworth (P-B) ratio. Discuss P-B ratio of Al, Cr and Li. (5)
10. Explain the effect of following allowing elements in steel: a) Chromium b) Silicon c) Manganese. (5)
11. Sketch Fe-Fe_3C phase diagram and label the phase fields. Discuss in brief the different reactions that take place in this system. (5)

12. Justify the reason behind melting of ice from the edges before the interior on the basis of metallurgical principle. (5)

OR

Justify that, "Body-Centered Cubic (BCC) structures are generally harder than Face-Centered Cubic (FCC) structures". (5)

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